DIVISION 8
INCIDENTALS

SECTION 801
CONSTRUCTION STAKES, LINES, AND GRADES

801-1 DESCRIPTION

This section outlines the Contractor's responsibility for engineering control when "Construction Surveying" is included as a pay item in a contract.

801-2 CONSTRUCTION METHODS

It is the Department's responsibility to establish on-the-ground horizontal baseline control and benchmarks for vertical control. It is the Contractor's responsibility to reference the Department-furnished horizontal and vertical control and to verify the validity and accuracy of the control. The Contractor shall notify the Engineer immediately when discrepancies are discovered. It is recommended that the Engineer schedule periodic meetings with the Contractor, especially during the initial phases of the project stakeout. The "Manual for Construction Layout" from the Construction Unit will be an invaluable tool to the Contractor. The Department will establish the location of all proposed right-of-way monuments. It is the Contractor's responsibility to reference the location of all proposed right-of-way monuments that fall within the construction limits and to reestablish this location when construction is completed in this area and then set the right-of-way monuments and guard stakes. The Contractor shall install an 18-inch long No. 5 reinforcing bar with a mounted right-of-way monument cap and a fiberglass witness stake. Unless concrete monuments are noted in the plans, the witness stake shall be located next to the right-of-way monument and driven approximately 12 inches into the ground. Caution the Contractor to not damage the monument cap or the witness stake during installation. The Department will furnish the monument cap and witness stake.

The Contractor is responsible for the preservation and undisturbed condition of Department-furnished stakes. The Contractor shall establish and identify clearing limits and provide all additional stakes, including - but not limited to - centerline, Y-line, connection, ramps, loops, slope stakes, right-of-way markers, fine grade stakes, construction benchmarks, and other reference points that may be necessary for the proper location, alignments, and grades for all roadway, structure, and miscellaneous items. When requested by the Engineer, the Contractor will perform any staking or restaking to ensure that all roadway, structure, and miscellaneous items are constructed in accordance with established lines and grades. For any staking beyond that normally performed, the Contractor shall keep cost records to verify the cost of checking the stakeout. If the original stakeout is found to be correct, the Department will reimburse the Contractor the verified actual cost of checking the stakeout, if requested. If the original stakeout is in error, the cost of checking and correcting the stakeout shall be at no cost to the Department. It is the intent of the Department to do only enough checking to be satisfied that the Contractor is performing satisfactorily.

The Contractor shall establish all temporary benchmarks needed for construction. The Department will relocate any Department-furnished benchmarks in conflict with construction if requested.

Measurements for payment of contract items are to be made by the Engineer. However, the Contractor is responsible for staking horizontal alignments as shown on the plans and also for horizontal alignment for the establishment of a baseline on borrow pits for accurate measurement

of quantities by the Engineer. The Contractor shall begin staking the horizontal alignments within 48 hours of the Engineer's notice to proceed. The Engineer may elect to take the cross-sections by hand or by aerial methods.

The Contractor shall stake these alignments just before the original and final cross-sections are taken and also immediately prior to estimating quantities for monthly estimate purposes, as deemed necessary by the Engineer. The Department will take all cross-sections for payment of monthly estimates or for final payment quantities. Stakeout of the survey line for final cross sections will be considered part of the work required prior to final project acceptance. The project can be accepted for maintenance with the exception of the survey line if all other items are complete and if requested by the Contractor. The Contractor's stakes to establish line and grade for subgrade, base course, curb and gutter, and related items shall be set at intervals not exceeding 50 feet. When the Engineer determines that due to line or grade the staking interval should be reduced, the Contractor shall set the stakes accordingly. The Contractor shall determine the offset distances for the grade stakes to accommodate the equipment used, working room, and windrows of material, including areas such as crossovers, intersections, and any irregular shaped areas. The slope stakes shall be set at all full and half stations. Fine grade hubs (blue tops) shall be set on both sides of each roadbed with referenced distances and grades.

Structure construction stakes and other reference control marks shall be set at sufficiently frequent intervals to assure that all components of the structure are built in accordance with the lines and grades on the plans. The Engineer will furnish the Contractor the finished construction elevations to determine the required construction elevations for bridges. The Contractor is responsible for all structure alignment control, grade control, and all necessary calculations. The Contractor shall furnish a layout drawing for each structure after staking for review by the Engineer before work on the structure begins.

All survey records made by the Contractor shall be made available to the Engineer. The Engineer reserves the right to check, correct, or require any layout work to be revised. The survey records shall be available to the Engineer during the life of the project and shall be submitted in total at the completion of work. All incorrect stakeouts shall be corrected by the Contractor prior to performing the affected work. No consideration for additional contract time or additional compensation will be given for incorrect construction layout or surveying required by this Specification except when such delays, corrective work, or additional work is through no fault of the Contractor.

The Contractor will review the proposed method for setting up the survey books at the beginning of work with the Engineer. This is the time to answer questions, make suggestions, and review the articles of this Specification with the Contractor. The Contractor shall submit 2 copies of all layout drawings for utility and drainage systems and for structures to the Engineer for his review and/or approval.

The Engineer will make periodic checks of the stakeout of roadway items for each type of staking with his own forces.

For structure items, the Engineer will visually check the stakeout of box culverts and other minor structures for conformity to the Contractor's layout drawings. For bridges, upon completion of the bridge stakeout and prior to work beginning, the Department's survey crew will make an independent check of each reference point and each temporary benchmark. The Contractor shall submit his method for computing buildups over beams, screed grades, and overhang form elevations to the Engineer for review prior to staking out these items.

Section 801-3 is specific in its description of what may be included in payment for "Supplemental Surveying." Unless additional surveying is required which meets one of these five items, there is no supplemental surveying. There is a tendency to describe all additional surveying in terms of number 4, "Surveying which the Engineer has deemed could not have been

anticipated or is not customary or inherent to the construction industry". Invoking this item should be the exception rather than the rule. The addition of drainage structures, pipe lengths, and most other plan revisions IS additional surveying that is inherent to the industry, therefore it is NOT "Supplemental Surveying." The negotiation of a unit price for the addition of a new line item(s) that requires surveying, or the overrun of an existing line item where an increase in unit price is established in accordance with Article 104-5, may include the cost of additional surveying. The acceptance of the inclusion of the extra surveying still lies with the approving authority.

SECTION 802
DISPOSAL OF WASTE AND DEBRIS

802-2 GENERAL REQUIREMENTS

The most critical aspect of this Specification is environmental stewardship.

When the Engineer permits disposal of waste material within the right of way, the Engineer should ensure that all applicable requirements of the Specifications are met. In addition, the Engineer should consider any detrimental effects to the project, such as overloading natural ground foundations under fills, diverting surface water runoff, overloading drainage systems, etc. The Engineer should also check the Environmental Impact Statement to be sure the document does not prohibit wasting within the right of way. The Contractor should submit a reclamation plan when requesting to waste material on the right of way.

The Contractor should also give consideration to the equitable financial reimbursement of contract funds to the Department when waste sites are allowed which are not in the original contract documents.

When a Contractor requests to use a public or commercial disposal site, the Engineer should inspect the site to determine if the site is an approved disposal site. Approved public or commercial disposal sites will have a license posted at the facility. Disposal of waste or debris shall not begin prior to the approval by the Engineer. In addition to requiring the disposal site to be permitted, the Engineer should not approve use of the site if excessive siltation or pollution could occur as a result of wasting operations. In questionable situations, the advice and consultation of the Area Roadside Environmental Engineer and/or the Division Environmental Officer should be obtained.

If the Contractor requests to utilize a site outside the right of way for disposal of waste and debris, the Engineer will **personally** inspect the proposed area. Before the Engineer may approve a site for disposal, the Contractor must obtain all required permits and submit an acceptable reclamation plan which complies with the details outlined in this section and any updates that may be noted in the contract provisions and environmental commitments. The requirements of various permitting and regulatory agencies are dynamic and the Engineer must stay abreast of the most current requirements. The Contractor must hire an environmental consultant from the Department's approved list to assess the proposed site for potential impacts. The boundaries of any wetlands or jurisdictional surface waters must be delineated. This site assessment must be submitted with the Contractor's reclamation plan. It is recommended that the Division Environmental Officer review this assessment for compliance.

Borrow and waste site reclamation procedures for contracted projects are located in Section 230 of this Manual or may be viewed online at the following website:
http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/fieldops/downloads/

This Reclamation Plan is required for **all** waste and disposal sites located on and/or off of the right of way with the exception of public or commercial disposal sites. The person preparing this plan shall be Level III-B E&SC/Stormwater Certified. Site selection and Reclamation Plan requirements should be reviewed at the preconstruction conference.

The Contractor and the property owner(s) shall **jointly** submit a Reclamation Plan for each waste area proposed. This plan shall address in **detail**, with sketches, site maps, etc., how the Contractor intends to develop, use, and reclaim the site. The Standard Specifications and the contract Standard Special Provisions list several items that the plan must address. The Engineer should determine if the plan provides adequate measures to control site erosion and ensures establishment of permanent measures. Although the Engineer is responsible for approving the plan, assistance may be obtained from the Division Engineer, the Roadside Environmental Field Operations Engineer, or the Division Environmental Officer as appropriate. Regional Engineers with the Land Quality Section of the Department of Environment and Natural Resources (DENR) are also available to assist in the review of site plans.

If reforestation is to be utilized, the areas to be reforested should be shown in the reclamation plan with a note that reforestation will be performed at no cost to the Department.

Upon receiving a Reclamation Plan, the Engineer should make a thorough and complete review to ensure all required information has been provided in the narrative and on the map. The form entitled "Reclamation Plan - Check List" should be completed for each plan received and attached to the Engineer's copy of the approved plan.

All erosion control devices should be checked for adequacy of design. The Engineer should not attempt to design the devices, but should make a quick check to ensure the devices are adequately sized and properly located for optimum effectiveness. The guide "Minimum Design Criteria for Temporary Erosion Control Devices" can be used for this review. If extensive calculations are needed, the Engineer should consult the Erosion Sediment Control Planning and Design Manual published by DENR. The Engineer should also review the design to determine if economics and good judgment have been used to design the erosion control measures. It should be clearly noted if any of the erosion control devices are to remain in place beyond the contract completion date.

Upon approval of the narrative and the map, the Engineer should document his approval by signing and dating the "Reclamation Plan - Narrative" and the "Reclamation Plan - Maps" or similar forms as "Approved with the following exceptions:" Any exceptions should be listed in detail. The Contractor and owner(s) should make any necessary modifications such that approval can be granted without any exceptions. Approval should not be granted until all signatures have been obtained.

Payment should be made for all erosion control measures specified in the Reclamation Plan unless otherwise noted in the approval letter. If payment cannot be made under items included in the contract, a Supplemental Agreement should be executed. Payment **shall not** be made for erosion control measures required as a result of the Contractor's negligence.

The Engineer must assure himself that the provisions contained in the approved Reclamation Plan are carried out both in letter and spirit. The Engineer should continually monitor each waste area to ensure that all requirements of the Reclamation Plan are carried out throughout the life of the project. The slopes of the waste area should be checked as they are constructed to ensure compliance with the plan and the specifications. It is much easier to construct a slope correctly than to regrade it after the waste area is complete. If the final condition of the site is not consistent with the approved plan but is in compliance with all environmental regulations, the plan must be modified to reflect the final condition and the modification signed by the property owner. **Final acceptance of the project will be contingent upon meeting the requirements of the Reclamation Plan**. **Establish a permanent stand of**

vegetation prior to acceptance of the project. A copy of each plan should be made available at the final inspection. It is not necessary to obtain a release from the property owner for use of the waste area at the conclusion of the project.

The property owner should be notified when the work is complete. The Department, DENR or its agents will conduct a one-year follow-up inspection and if necessary, the Contractor will perform any necessary repairs.

In many instances it may be beneficial to take sufficient pictures before work is performed to establish the original condition and appearance of the proposed waste site and surrounding area. No Department personnel shall be involved in negotiations for the right to dispose of waste and debris other than to provide or interpret any applicable section of the Specifications.

All earth surfaces of waste areas shall be seeded and mulched in accordance with the Specifications. Any waste areas, which lie undisturbed more than 21 days, should be temporarily seeded if erodible surfaces are left exposed. The Contractor is required to perform staged permanent seeding on all available areas to improve the long-term establishment of vegetation. Established vegetation within waste areas should be topdressed at the same frequency as the project.

The Engineer and Technician should periodically review disposal operations to ensure that the applicable requirements of the Specifications and the Reclamation Plan are being met. Particular attention should be given to ensure that adjacent or abutting property is suffering no detrimental effects as a result of the wasting operation. If damage to adjacent or abutting property is occurring, disposal of waste and debris should be halted until corrective action is taken (See Articles 105-16, 107-12, and 108-7). The requirements in the Specifications for control of erosion are for the protection of adjacent, abutting, and downstream properties as much as for the protection of the actual pieces of property being used as a disposal area. Certain buffer zones and setbacks are required.

802-3 MEASUREMENT AND PAYMENT

Payment will be made at contract unit prices for the work of seeding and mulching waste or disposal areas. Borrow or unclassified material used to cover waste and debris shall be provided at the Contractor’s expense.

Temporary erosion control measures will be paid for at the appropriate contract or negotiated unit prices. However, payment will not be made when the measures are required as a result of the Contractor's negligence or deemed inappropriate by the Engineer.

TECHNICIAN'S CHECKLIST
SECTION 802
DISPOSAL OF WASTE AND DEBRIS

1) The Technician must be familiar with requirements of Sections 105-16, 107-12, 107-13, 108-7, and 802 of the Standard Specifications as well as the Reclamation Plan, all permits and DENR regulations.
2) Have the Contractor **and** the property owner(s) submitted and had approved by the Engineer a Waste Area Development, Use and Reclamation Plan for **each** waste area proposed?
3) The Technician and Engineer should consider any possible damage or detrimental effects to the project if disposal within the right of way is permitted. Furthermore, an agreement for equitable compensation should be made where the Contractor has requested to waste material on the right of way when not detailed in the original bid documents.
4) The Technician should make an on-site inspection of the proposed site after the Reclamation Plan has been approved and before wasting operations begin to try to anticipate any problems that may arise.
5) The Technician should make frequent checks of the site to ensure that the requirements in the Specifications and the Reclamation Plan are being met and to ascertain any detrimental effects that may be occurring to abutting or adjacent property or streams; operations should be suspended until corrective measures are taken if inadequacies are found.
6) The Technician should ensure that the waste area is properly shaped to blend with adjacent topography before seeding and mulching is performed.
7) Ensure that staged seeding and mulching is performed and final seeding and mulching is performed as soon as possible.
8) Ensure that each waste area is topdressed if applicable.
9) Ensure that all pay items as defined in the Specifications (Section 802-3) are measured and properly recorded in appropriate pay record books.
10) Establish a permanent stand of vegetation prior to acceptance of the project.

SECTION 806
RIGHT OF WAY AND CONTROL OF ACCESS MARKERS

806-3 CONSTRUCTION METHODS

Prior to construction, the existing right of way markers should be referenced. Care should be exercised to protect those right of way markers that were set by the Location and Surveys Unit. Right of way markers should not be used for survey control during construction. Markers must be staked and set accurately as they constitute the highway's property corners. Refer to the Engineering Control Section for proper procedure for layout. Proper care should be taken in the placement of these markers to assure both correct vertical and horizontal alignment. Markers may be eliminated if conditions warrant; however, this should only be done with the approval of the Engineer. Refer also to Standards 806.01 and 806.02 of the Roadway Standards. When right of way markers are installed on property which is mowed, the markers should be installed flush with the ground.

The Department should not set new corners in the right of way line at its intersection with a property line. The Department should hire a Registered Land Surveyor. Prior to construction, careful measurements should be made referencing the property corners. Upon construction completion, the Department can go back and reset that point. At no time should the Department state that we are resetting a property corner. The Department is simply re-establishing the location of an iron in the ground, for whatever reason it may be there.

TECHNICIAN'S CHECKLIST
SECTION 806
RIGHT OF WAY MARKERS

1) Consult plans, Standard Specifications and the Manual for Construction Layout.
2) Verify that adequate reference hubs are in place to ensure accurate placement of markers.
3) Reference hubs should be protected to allow inspection of this work.
4) Check proper horizontal and vertical alignment.
5) Make appropriate entries in pay record book.

SECTION 808
OBLITERATION OF EXISTING ROAD

808-2 CONSTRUCTION METHODS

This section of the Specifications provides for the destruction of any existing pavement **outside of the construction limits but within the right of way**. This also includes the filling, shaping, grading, etc., of the entire roadway of this existing pavement to provide a pleasing appearance and to blend in with adjacent topography. After obliteration of the roadway, the disturbed area should be seeded and mulched. The work in this section gives the Engineer a great deal of latitude in judgment in deciding the degree of work done to a roadbed. Careful thought must be given to this item to properly grade the section to blend in with the surrounding landscape and provide proper drainage.

Any existing pavement shall be removed in accordance with Section 250 of the Specifications.

Any earthwork shall be performed in accordance with Sections 225 and 230 of the Standard Specifications.

808-3 MEASUREMENT AND PAYMENT

Obliteration of Existing Road will be paid in accordance with various contract items listed in Article 808-3 of the Specifications. The construction methods, measurements and compensation should be followed for each item utilized during the obliteration.

If the contract calls for breaking up of existing asphalt and/or concrete pavement and this material is to be left in place, the Contractor shall add additional borrow or unclassified material and blend as necessary to insure that no voids remain.

TECHNICIAN'S CHECKLIST
SECTION 808
OBLITERATION OF EXISTING ROAD

1) Determine the desired degree of obliteration of a roadbed prior to the Contractor beginning work on this item.
2) Cross sections must be obtained prior to initiation of this work. Original cross sections for any unclassified excavation necessary to shape the roadway should be taken after the pavement has been removed.
3) Review all applicable sections of the Specifications (Sections 225, 230, 250, etc.) prior to beginning this work.
4) Quantities should be measured and appropriate entries made in pay record books.

SECTION 815
SUBSURFACE DRAINAGE

815-1 DESCRIPTION

This section applies to the construction of any subsurface drainage system except shoulder drains.

815-3 CONSTRUCTION METHODS

Subsurface drainage is a critical aspect in constructing a good supporting base for pavements.

The Engineer and/or Technician should anticipate and determine the need for subsurface drainage as far in advance as possible. When the need for subsurface drainage is known during the planning phase, a table containing the information will be included in the plans. The Engineer should examine the subsurface investigation information and compare the water table elevation to the profile grade to anticipate the need for subsurface drainage. The Engineer and his Technician must maintain close contact with the Contractor's grading and pipe installations to observe any preliminary indications of wet conditions that may be resolved with subsurface drainage. Ensure the correct type of aggregate is employed in the subsurface drainage system and that the system is installed at least 6 ft. deep where proof rolling will be performed.

Surface water situations caused by improper ditching, rain, etc., are not valid reasons for installing subsurface drainage. Subsurface drains should not be installed as an aid to the Contractor in removing material above subgrade. It is the Contractor's responsibility to remove material down to subgrade. The Contractor is required by Article 225-3 to cut above grade ditches to eliminate this condition. Check project special provisions to determine if the Contractor is required to excavate ditches and allow them to function for some time period prior to beginning additional earthwork operations. When an area of the subgrade is observed that may require the addition of some form of subsurface drainage, the Engineer should be consulted for assistance in determining the necessity or extent of a subsurface system that might be required. In extreme cases, or if extremely large quantities are anticipated, the Geotechnical Unit should be consulted for assistance in determining the nature and extent of the system required.

The Engineer may request the Geotechnical Unit to perform an investigation of the subgrade to determine the necessity and type of subsurface drainage required. The Engineer should be on site to assist in this investigation. It is the policy of the Geotechnical Unit that the grade should be within one foot of subgrade before they make an investigation. It is also important that proper side and median ditches be cut to grade before an investigation is undertaken. Wet subgrade conditions are often the result of improper surface drainage and construction methods. In unusual or extenuating circumstances, the Geotechnical Unit will determine if they can make an investigation when the grade is more than one foot above subgrade. After the investigation, the Geotechnical Unit will make appropriate recommendations to the Engineer.

A request, investigation, and decision for the need for subsurface drainage may require a week or more from beginning to end. Once a subsurface system is installed, allow the system to function for up to 30 days or a sufficient time as determined by the engineer. Subsurface drainage outlets should be tied into storm drainage structures wherever possible.

Subsurface drainage will not cure all wet conditions. Depending on the soil type, subsurface drainage may cure the problem. If the material has a high Plasticity Index and/or will not drain, some other method may be necessary or required in conjunction with subsurface

drainage. If the subsurface drainage does not effectively dry the subgrade, consult the Geotechnical Unit.

This section also permits the use of blind drains or "French" drains. The installation of a sand blanket under the subgrade is not covered under this section and must be negotiated separately with the Contractor. Material requirements may be the same for the sand as indicated in this section.

Spring boxes, as covered in Section 840, may also be necessary in conjunction with subsurface systems.

The installation of steel markers and/or pavement marking is critical to the long-term success of underdrain (Standard Drawing 816.04). Many failures are attributable to outlet failure. Outlet maintenance can only be performed where the location of the outlet is known.

In summary, anticipation, coordination, and expeditious handling by the Engineer are very important. Subsurface drainage is relatively inexpensive compared to the project as a whole and should be considered even in marginal cases. Underground water conditions are subject to change, and the installation of such a system could prevent a failure in subsequent years.

815-4 MEASUREMENT AND PAYMENT

The Specifications state that "the authorized trench width will be the width shown on the plans or as directed." The standard plan sheet for underdrain and blind drain indicates the trench width to be the diameter of the pipe plus 6 inches on either side of the pipe. Refer to Standard 815.03 of the Roadway Standards. Where the need for coarse aggregate and filter fabic is indicated in the plans or added by the Engineer, a special detail will be included in the plans or will be incorporated in the supplemental agreement for subdrain coarse aggregate and filter fabric. If the Contractor elects to excavate outside the width of trench limits indicated on the plans or agreed to by the Engineer, it will be at his expense and appropriate deductions must be made. The normal trench width with a standard bucket on a mechanical excavator is 18 inches. Larger widths may be agreed upon in rare circumstances.

Deviations in the authorized excavation dimensions should be immediately pointed out to the Contractor so that he will not perform work for which he will not be paid. The notice to the Contractor that he exceeded the pay limits shall be entered in the diary as it could prevent future disagreement about the quantities.

The subdrain pipe volume should be deducted from the cross-section used to compute the fine and course aggregate.

TECHNICIAN'S CHECKLIST
SECTION 815
SUBSURFACE DRAINAGE

1) Review the subsurface information to anticipate the need for subsurface drainage.
2) Check the limits of the Contractor's excavation against authorized limits of excavation. Advise the Contractor of substantial deviations and make accompanying diary entries.
3) Check to ensure that sidewalls of excavated ditches do not slough inward and contaminate fine aggregate. Sloughing prevents the system from functioning properly.
4) Ensure the system has been allowed to function a minimum of 30 days.
5) Check the position of perforations on each joint of pipe laid.
6) Check backfill procedures to determine if pipe remains correctly aligned and coupled.
7) Pay Record Book entries should indicate the actual width of the authorized trench.
8) If proof rolling is to be performed over subsurface drainage installation, there must be a minimum of six feet of cover to avoid crushing the pipe.
9) Install steel markers and pavement markings at all outlets.

SECTION 816
SHOULDER DRAINS

816-2 MATERIALS

The Specifications require the use of HDPE or PVC pipe as an outlet.

816-3 CONSTRUCTION METHODS

Consult the applicable Standards and plan sheets to determine the typical section to be used for the trench width and depth and the beginning and ending stations. Placing pipe outlets into drainage structures is preferred.

Where shoulder drain outlets discharge directly into ditches, the invert (flow line) grade of the outlet pipe should be set high enough above the ditch grade outlet to provide a positive discharge. The installation of steel markers and pavement marking is critical to the long-term success of underdrain. Many failures are attributable to outlet failure. Outlet maintenance can only be performed where the location of the outlet is known.

The Contractor must be cautioned to exercise care to achieve the splice requirements while preventing damage to the fabric. **All persons involved with the use of filter fabric should be made to realize that the fabric becomes unstable with exposure to sunlight. Section 816-3 limits the sunlight exposure of the fabric to seven days.** During shoulder drain installation, care must be taken to avoid crushing the pipe prior to paving operations. If there is some question as to the soundness of the installation, the Pavement Section can be contacted for a camera investigation. Maintain the proper grade on the pipe and do not allow bends and sags. The proper installation of adequate shoulder drains has been proven critical to future pavement success. If there is some question as to the need for additional shoulder drain, the issue should be discussed with the Engineer.

TECHNICIAN'S CHECKLIST
SECTION 816
SHOULDER DRAINS

1) Check the limits and location of excavation against Standard Drawings. Advise the Contractor of any substantial deviation. Document any such notice given to the Contractor in the Daily Diary.
2) Ensure that certification for the fabric has been received.
3) Check fabric joints for Specification compliance.
4) Check jointing of subdrain pipe.
5) Measure pipe and excavation lengths. Make appropriate entries in the pay record book.
6) The Specifications limit exposure of the fabric to sunlight to seven days. This also includes the top layer, which must be covered by drainage course. If the Contractor cannot cover fabric with drainage course or other specified materials, the Contractor should cover the fabric with temporary material.
7) Install steel and pavement markings at outlets as required.

SECTION 818
BLOTTING SAND

818-1 DESCRIPTION

This article of the Specifications provides for the furnishing and placing of blotting sand on asphalt surface treatment, prime coat, asphalt curing seal, etc., to enable local traffic to cross the surface without causing damage to either the vehicle or the roadway surface.

818-3 CONSTRUCTION METHODS

The Technician should determine where the blotting sand will be applied so that the quantity needed can be determined. The Technician should also require the Contractor to have the blotting sand, application equipment, and personnel ready and available prior to allowing him to begin placement of the asphalt materials. The blotting sand should be applied within the same day as the applied prime coat, asphalt surface treatment, or asphalt curing seal.

If blotting sand is coming from a fire ant quarantine area, ensure that it is free of contamination.

818-4 MEASUREMENT AND PAYMENT

Payment for the blotting sand will be by the ton as determined by weighing the load on certified platform scales. If any portion of a truck load of blotting sand is not needed, the Technician should estimate the remaining portion by volume measurements and unit weight and deduct the unused amount from the weight ticket. It is recommended that the Contractor be advised of the amount deducted.

TECHNICIAN'S CHECKLIST
SECTION 818
BLOTTING SAND

1) Advise the Contractor's superintendent where sand will be needed.
2) Be sure blotting sand and equipment meets Specifications and is available before allowing the asphalt material to be placed.
3) Ensure the blotting sand is free of fire ants.
4) Check after application of blotting sand to ensure that application is uniform and sufficient.
5) Record needed information on the weight ticket, including any deduction for unused sand.

SECTION 820
FUNNELS AND FUNNEL DRAINS

820-3 CONSTRUCTION METHODS

Before beginning installation of funnel drains on a project, check with the Engineer to determine if original plan locations are still warranted or if any additional funnel drains will be required. Review the plans, determine if guardrail is required, and stake funnel drains so that they do not interfere with the guardrail posts. Refer to Standard Number 820.01 before beginning installation of funnel or funnel drains. Special attention must be given to the inlet area of the shoulder adjacent to the metal funnel to ensure that water will drain into the inlet. All joints shall be properly connected and sealed with asphalt or silicon material if required by the contract. All backfill shall be tamped in 6-inch layers and compacted to a degree comparable to the adjacent undisturbed material. When earth berms are constructed in conjunction with the installation of metal funnels, it is critical that they be compacted to prevent erosion, siltation, etc. Special attention should be given to the outlet end of the funnel drain to ensure that water will not pond or cause erosion.

TECHNICIAN'S CHECKLIST
SECTION 820
FUNNELS AND FUNNEL DRAINS

1) Stake out guardrail to ensure the funnels do not conflict with the guardrail posts.
2) Ensure the earth berms are compacted.

SECTION 825
INCIDENTAL CONCRETE CONSTRUCTION

825-1 DESCRIPTION

All incidental concrete is described in this Section. Specific requirements for each incidental concrete item are given in the appropriate article number of the Specifications governing that item.

825-2 FORMS

(A) GENERAL

Forms shall be sufficiently constructed and braced to provide rigid support to the concrete item being constructed. All inside form surfaces shall be thoroughly coated with form oil or an equivalent coating before concrete is placed to prevent tearing of forms or rupture of concrete surface when form is removed. The Technician shall check the forms for cleanliness, depth, width, length, rigidity, etc., before concrete is placed. If excessive bulging or separation of the forms is observed, the Technician should advise the Contractor to suspend the placement of concrete until the forms can be adequately braced and/or repaired.

(B) WOOD FORMS

Forms with torn areas, patches, worn edges, etc., shall not be used in contact with concrete that will remain visible.

(C) METAL FORMS

Metal forms shall be checked for alignment, surface texture, etc. Metal forms shall be free from all foreign matter that might affect the surface texture or color of the concrete.

825-3 REINFORCEMENT

Reinforcement shall be furnished and placed as indicated on the plans and in accordance with the provisions of Section 425 of the Specifications. The Technician should familiarize himself with the requirements of Section 425 before placement of the reinforcing steel in incidental concrete structures. Reinforcing steel must be adequately supported to prevent displacement during concrete placement. Exposed reinforcing steel shall not be subject to any movement, bending, or other displacement.

825-4 PLACING CONCRETE

The Technician shall check the foundation, form work, bracing, placement of reinforcing steel, etc., before any concrete is placed by the Contractor. The area to receive concrete shall be moist, clean, and free of any deleterious substance. Test concrete in accordance with Article 1000-4, as applicable. Concrete shall be so placed as to avoid segregation of the concrete or displacement of the reinforcing steel. The concrete may be consolidated by vibration, spading with shovel, or rodding, whichever circumstances dictate. Special attention should be given to the consolidation of the concrete adjacent to the form to produce a smooth finish free from air,

water, or honeycomb pockets. Concrete cylinders will be made as per the Minimum Sampling Guide.

825-6 FINISHING

Consult the applicable Article for the type of finish required for each concrete item being constructed.

825-7 REMOVING FORMS

Forms shall not be removed from the concrete structure until the concrete has hardened sufficiently to resist any spalling, cracking, etc.

825-8 PROTECTION FROM COLD WEATHER

If cold weather is anticipated, the Contractor should have appropriate cold weather protection techniques at the site and readily available prior to placing concrete.

825-9 CURING

This article of the Specifications states that the curing period shall be seven curing days and limits the method of curing to the use of membrane curing compound in accordance with Article 700-9(B) of the Specifications. A curing day is considered as any 24-hour period beginning when the casting of the concrete is completed during which the air temperature adjacent to the concrete does not fall below 40°F. The Technician shall make sufficient checks with high-low thermometers to determine if the temperature requirements are being met. These checks and results should be documented in the Technician's Daily Report.

825-10 JOINTS

The Technician should familiarize himself with the requirements for the types of joints and joint sealers required for the particular type of construction involved. Consideration should be given to the type and amount of foot traffic prior to sealing joints where foot traffic is likely to be present.

TECHNICIAN'S CHECKLIST
SECTION 825
INCIDENTAL CONCRETE CONSTRUCTION

1) The Technician should have a method to track the samples to ensure the proper amount of samples are taken for each concrete item.
2) Document in the Technician’s Daily Report whether the item is constructed in accordance with the Specifications.
3) Ensure proper curing.

SECTION 828
TEMPORARY STEEL COVER FOR MASONRY DRAINAGE STRUCTURES

828-2 MATERIALS

Provide materials that are Grade A36 steel and the size and thickness shown on the plans.

SECTION 830
BRICK MASONRY CONSTRUCTION

830-2 CONSTRUCTION METHODS

All concrete portions of the structure shall be constructed in accordance with the requirements of Article 825. All footings shall be constructed using forms unless otherwise specifically approved by the Engineer.

830-4 LAYING BRICK

The Technician shall refer to the appropriate standard for the individual item to be constructed for details as to the placement of the header course. **All brick shall be laid with completely filled mortar joints**.

830-5 PROTECTION FROM COLD WEATHER

The protection referred to in this article of the Specifications is for any concrete or mortar portion of the structure. Protection may be provided by the use of heated enclosures or any other suitable method approved by the Engineer that will prevent the freezing of the concrete or mortar portion and allow adequate curing temperatures. The curing day is considered as any consecutive 24-hour period beginning when the last masonry unit was set in place in the structure during which the air temperature adjacent to the structure does not fall below 40°F. The Technician shall periodically check the protective measures with a high-low thermometer to ensure that the requirements of the Specifications are being met. These checks and the results should be documented in the Technician's Daily Report.

SECTION 832

REINFORCED BRICK MASONRY CONSTRUCTION

832-2 CONCRETE CONSTRUCTION

It should be noted that the slump of Class M concrete should be no greater than necessary to place the concrete. The addition of water should be monitored very closely so as not to weaken the strength of the Class M concrete by excessive water. **Class M concrete shall not be vibrated** but rather shall be rodded. All footings shall be formed unless otherwise specifically approved by the Engineer in extenuating circumstances.

832-3 MORTAR

Mortar shall meet the requirements of Article 1040-8 of the Specifications and shall be machine mixed for not less than 1-1/2 minutes. The Technician should periodically check the mortar to determine that it has not developed initial set or lost plasticity.

832-4 LAYING BRICK

The Technician shall refer to the applicable standard for the requirements for laying brick. All joints shall be completely mortar filled.

832-6 MEASUREMENT AND PAYMENT

There is no direct payment for the work covered by this section.

SECTION 834
BLOCK MASONRY CONSTRUCTION

834-2 CONCRETE CONSTRUCTION

All footings shall be formed unless otherwise specifically approved by the Engineer in extenuating circumstances.

834-3 MORTAR

The Technician should periodically check the mortar to determine that it has not developed initial set or has lost plasticity.

834-6 COMPENSATION

There is no direct payment for the work covered by this section.

SECTION 838
ENDWALLS

838-2 MATERIALS

Use Portland cement concrete or brick masonry for the endwalls unless specified otherwise in the plans. The Contractor should submit a request in writing for using precast sections to the Engineer.

838-3 CONSTRUCTION METHODS

(A) FOUNDATIONS

Prior to beginning any work on endwalls, check the stakeout to assure that the Clear Roadside Recovery Zone will not be encroached upon by the completed endwall. Assistance on determining this distance is available in "The Roadside Design Guide" and the Department's Guardrail Design Manual. The Technician shall inspect and approve the foundation prior to the placement of concrete or masonry. The foundation shall be free of all loose material and shaped on all planes to a firm surface. If the foundation consists of hard rock that may require stepping, the Technician shall consult with the Engineer for the requirements for this foundation. If undercut is required, payment will be made as outlined in Article 300-9. If the Technician is not sure of the quality of the existing foundation, he shall consult with the Engineer.

(B) CONCRETE AND MASONRY

The Engineer does have the authority to make minor revisions in the dimensions of the structure and footings if necessary to fit field conditions. The Technician should consult with the Engineer before making any major change in the dimensions. The Technician shall check and approve the form condition, depth, width, height, reinforcement, etc., prior to the placement of concrete by the Contractor. These checks should be documented in the Technician's Daily Report.

838-4 MEASUREMENT AND PAYMENT

This article provides that the quantity of concrete, brick, block, reinforced concrete, reinforced brick, or reinforced block to be paid will be computed from the dimensions shown in the plans unless the dimensions were revised by the Engineer.

The footing for brick masonry endwalls shall be measured and included in the quantity of brick masonry and paid for as brick masonry.

SECTION 840
MINOR DRAINAGE STRUCTURES

840-1 DESCRIPTION

When it is necessary that drawings be furnished by the Contractor for approval, the Engineer, upon receipt, shall forward them to the Technical Services Division for review and approval along with any recommendations and comments he deems appropriate.

840-2 MATERIALS

Producers are allowed to stockpile standard precast items. This allows for faster completion of construction projects and allows for better response time for Department Technicians in inspecting these completed items. The Materials & Tests Unit will handle inspection and testing of the material. Once the items have been tested and accepted, each piece will be stamped "NCDOT APPROVED." Shipping of material that has not been approved may result in the producer being removed from the Department's Precast Concrete Quality Control/Quality Assurance Program and the producer will not be allowed to produce material for stock. Once an item has been stamped approved, it shall be stored in an area designated for Department approved materials. A test report will be generated by the Materials & Tests Technician and filed in the Records Section of the Materials & Tests Unit.

Each item cast must have the designated markings, or piece number, on the member that clearly identifies the producer, date of manufacture and piece number. Additional markings such as company logos are optional.

The following is an example of how each member must be marked:

Piece Number 5002-030106-2

5002: This number represents the producer's identification number.
030106: The date of manufacture is March 1, 2006.
2: The second item produced in this lot.

When the item is delivered to a project, the project personnel will verify that the item is approved for use by ensuring that it is stamped "NCDOT APPROVED." A Materials Received Report will be completed. Ensure that all information such as sizes, piece numbers, and name of manufacturer are listed on the Materials Received Report. Prior to installation, the project personnel will inspect the items for any damage which may have occurred during shipment such as cracks, breaks, etc., and reject any items they find unacceptable. A test report for the item will not be sent to the Engineer. However, the Field Inspection Report is available in HiCAMS.

840-3 CONSTRUCTION METHODS

(A) EXCAVATION

All OSHA requirements and other regulations governing trenching and shoring shall be observed. If the Technician observes a condition that constitutes "imminent danger" he should immediately direct the Contractor to cease the offending operation and immediately contact the Engineer.

The order to cease can be hand written with a copy retained for project records.

(B) FOUNDATION

The Technician shall check and approve the foundation prior to the placement of any masonry by the Contractor. If the foundation material is of poor supporting value, the existing material may be undercut and backfilled as directed by the Engineer. If the Technician is unsure of the adequacy of the supporting value of the foundation material, he shall consult with the Engineer. The backfill material should be compacted to a degree comparable to the undisturbed adjacent material. In precast installations, a foundation conditioning material is required in order to stabilize the bottom slab and evenly distribute the loads to the foundation.

(C) CAST-IN-PLACE CONCRETE, BRICK, AND BLOCK MASONRY

The Engineer has the authority to vary the dimensions of the structure and footings to fit field conditions. Appropriate entries shall be made in the pay record books stating the reasons for the variance in these dimensions and indicating clearly the shape, size, etc., of the structure.

(D) INSTALLATION OF PRECAST UNITS

The precast unit components should be examined carefully for any structural damage during shipment and handling of the components. The Engineer, if necessary, may authorize minor repairs. Refer to Article 1040-8 of the Standard Specifications. The manufacturer's recommendations should be followed during assembly of the unit. A structurally sound and functioning drainage unit must be the end result of the installation. When assembling precast drainage structure units seal joints with a flexible butyl rubber. Major repairs to the units should not be undertaken without prior consultation with the Materials & Tests Unit.

Pipes cannot be installed in the corners of precast masonry drainage structures unless a hole has been cast specifically for that purpose. The only portion of a precast drainage structure that can be removed for pipe installation is the three-inch knock-out. No horizontal or vertical members can be removed.

Following installation of a precast masonry drainage structure, the drainage structure invert must be filled with an approved concrete up to the elevation of the outlet pipe. The bottom of the drainage structure should be cleaned of any soil or debris before the invert is poured.

(E) FITTINGS AND CONNECTIONS

All pipe shall be cut flush with the inside wall and grouted as necessary to provide a smooth and uniform surface on the inside of the structure. Pipe should be cut prior to building the surrounding wall. The use of **non-shrink grout** is recommended. The grout shall be cured. Approved non-shrink grouts are listed on the following website:
https://connect.ncdot.gov/resources/Materials/Pages/default.aspx

All metal frames shall be set in full, mortared beds or otherwise secured by methods approved by the Engineer.

(F) BACKFILL

Backfilling shall not be done until the structure has been cured for at least seven curing days unless otherwise permitted by the Engineer. The Technician shall check the degree of compaction of backfill adjacent to the structure. Inadequate backfill compaction adjacent to miscellaneous drainage structures is a source of maintenance problems. Periodic density tests shall be run on this backfill. When a density test is not performed, the Technician shall check by probing, etc., to determine if the backfill material is thoroughly compacted throughout its depth. Preferably, the Technician should be present to observe the complete backfill operation. The Technician should check the drainage structure after its completion and before final acceptance of the project to determine if any settlement has occurred. If settlement is observed, the Contractor should properly correct the situation.

ADDITIONAL CONCERNS

Masonry drainage structures that are within four feet of a travel way must be traffic bearing unless they are in 2'-6" curb and gutter or in a concrete traffic island. If drainage structures are installed in expressway gutter or shoulder berm gutter and are within four feet of the travelway they must be traffic bearing. For these types of installations, a precast solid wall structure is considered traffic bearing.

The Technician should verify that the correct grates and frames are used.

Traffic phasing may require that a traffic bearing drainage structure/grate and frame be used where a non-traffic bearing drainage structure/grate and frame are required by the plans for the final traffic pattern.

840-4 MEASUREMENT AND PAYMENT

The Technician should document all pipes entering the box so that they may be deducted from the quantities of the drainage structure in the pay record book.

Payment for foundation conditioning material utilized under minor precast drainage structure floor slabs will be made in accordance with Article 300-9.

SECTION 846
CONCRETE CURB, CURB AND GUTTER, CONCRETE GUTTER, SHOULDER BERM GUTTER, CONCRETE EXPRESSWAY GUTTER, CONCRETE VALLEY GUTTER

846-3 CONSTRUCTION METHODS

(A) GENERAL

Prior to the placement of forms for curb and gutter, etc., the base or subgrade shall have been compacted to the degree required by the applicable section of the Specifications. As this item of work is one of the most visual of any item on a highway construction project, the Engineer and Technician should ensure that it is built to the proper line and grade and finished according to the Specifications. Poor curb and gutter construction will detract from the appearance of the entire roadway. The Contractor may elect to "slip form" the curb and gutter. If the Contractor chooses this option, he will have to submit a special non-vibrated concrete mix design.

The surface of the concrete should be given a light broom finish parallel to the curb or gutter line. As the appearance of curb and gutter is crucial to the appearance of the entire project, the Technician should constantly observe the finishing operations to ensure that good workmanship is being received.

Cure concrete in accordance with Subarticle 700-9(B).

(B) FORMS

The Technician shall check and approve the form alignment and grade before the placement of any concrete. Flexible forms are typically utilized by the Contractor for sharp radii, and these are considered acceptable provided they will adequately support the typical section required. A string line or 10-foot straightedge shall be used to check the forms for straightness requirements. After forms are set, they shall be checked for alignment and grade according to the stakes previously established for this work. The Technician shall then check the entire form length for any visual irregularities in line or grade. If any major irregularities or discrepancies are noticed, the Technician shall consult with the Survey Party to determine if the grade stakes are correct. The Technician should also check the forms or slip-form machine to ensure that the thickness and shape of curb or curb and gutter conforms to the Standard Drawing. **Do not take for granted that the forms or machine are set correctly.**

(C) JOINTS

No joint spacing shall be less than five feet. If there is a crack closer than five feet to a joint, then at least a 5-foot section must be removed and replaced. Curb and gutter placed adjacent to concrete pavement shall have the joints in the curb and gutter located to line up with joints in the concrete pavement. The Engineer does have the authority to alter joint spacing in order to prevent uncontrolled cracking. The Technician should periodically check the joints in the concrete curb and gutter to ensure that depth and width requirements of the joints are being met. Where curb and gutter is placed adjacent to any rigid object, expansion joints must be utilized. In curb and gutter sections, joint sealer shall not be poured above the top surface of the gutter. **Joints in curb and gutter shall be sealed prior to backfilling or performing other adjacent operations.** The Technician should check the joint operation and sealing operations at

their initiations to determine if the requirements of the Specifications are being met. If a section is damaged prior to final acceptance, the minimum removal size will be five feet.

Form grooved contraction joints as required by Article 825-10(B).

(D) SURFACE TOLERANCES

The finished surface shall not vary from a straight line by more than 1/4 inch when checked longitudinally with a 10-foot straightedge. The Technician should check this tolerance constantly to ensure that this requirement is being met. Specific attention should be given to this requirement to have a clear understanding with the Contractor of the tolerances that are expected. The Contractor should be immediately advised of any discrepancies noted, and if he proposes any corrective action other than removal and replacement of the curb and gutter at his expense, it must be approved by the Engineer. The finished gutter shall be checked by the Technician to ensure there is no standing water. This can be accomplished by the use of a straightedge, string line, or water after initial set of the curb and gutter. Prior to the final acceptance, the Contractor shall clean the curbs that are stained due to his operations. This would include earth material stains, asphalt stains, and tack material on curb. Tire marks due to the Contractor's operations shall also be removed. The Contractor is responsible for any defacing of the curb and gutter due to vandalism or weather.

(E) BACKFILLING

Any honeycombing, etc., that is necessary to be patched prior to backfilling shall be pointed out to the Contractor as soon as forms are removed and prior to curing compound being applied. The backfill material shall be compacted to the same degree as adjacent undisturbed material. Backfilling should be accomplished as soon as possible after the specified three day curing period to prevent possible undermining and washing of base material under the curb and gutter. The joints should be poured in the gutter prior to being backfilled to prevent contaminating the joints with earth material, which would prevent adherence of the joint sealer.

Until backfill is placed, it is crucial that proper drainage be provided behind the curb to assure that water does not stand against the curb and undermine any sections of the gutter. Any damage to the curb and gutter or base material under the gutter as a result of improper drainage shall be repaired at no cost to the Department.

(F) OPENING TO TRAFFIC

Prior to placing traffic through a curb and gutter section, the Engineer should ensure that all corrective actions have been performed and the concrete has reached strength.

846-4 MEASUREMENT AND PAYMENT

The Technician should remember when completing the pay record book for the items covered by this section of the Specifications to clearly delineate the size and type of the curb and gutter.

TECHNICIAN'S CHECKLIST
SECTION 846
CONCRETE CURB, CURB AND GUTTER, AND GUTTER

1) Subgrade should have been properly compacted and shaped prior to form placement.
2) Check the soundness of forms prior to placement.
3) The forms and/or slip-form machine should be set according to given line and grade and checked, including shape and thickness, prior to concrete placement.
4) Forms should be cleaned and oiled.
5) The Technician should ensure that joints are placed in the correct location.
6) Finished curb and gutter should be checked immediately following placement for surface tolerances, low spots, irregularities, honeycomb, etc.
7) Curing should be performed in accordance with Article 825-9 of the Standard Specifications.
8) Concrete should be protected from cold weather in accordance with Article 825-8 of the Standard Specifications.
9) Joints should be sealed according to the Specifications.
10) Adequate drainage should be provided to direct water away from the curb and gutter section before backfilling operations are commenced.
11) All corrective measures shall have been performed prior to opening the section to traffic.
12) The Contractor should not mark or deface the curb and gutter by subsequent construction operations.

SECTION 848
CONCRETE SIDEWALKS, DRIVEWAYS, AND CURB RAMPS

848-3 CONSTRUCTION METHODS

The Technician shall check the subgrade under sidewalks and driveways prior to the placement of concrete for proper compaction, stability, typical section, etc. The Technician should refer to the appropriate standard for requirements of joints. The brooming of the concrete surface finish shall be done transversely to the direction of the sidewalk. Joints should not be placed closer than five feet. Seal expansion joints where sidewalk and curb ramps are placed adjacent to concrete curb and/or gutter. Consideration should be given to the effect of asphalt sealant upon foot traffic prior to its use in sealing expansion joints. Grooved joints shall not be sealed.

All forms shall be sufficiently staked and braced to prevent displacement during construction operations. Flexible forms are normally utilized in sharp radii and are considered acceptable if they will adequately support the section required. Backfill shall be placed no sooner than three curing days and no more than seven curing days after casting of the sidewalk or driveway. The backfill shall be compacted to a degree comparable to the adjacent undisturbed material.

When driveways are to be constructed leading into populated property, the Technician should contact the property owner and advise him when the driveway will be constructed and when the property owner may expect to use the driveway. The property owner should be contacted prior to placing the driveway to ensure that the planned driveway meets the needs of those utilizing the property. Frequently, there are changes that can be made by the Engineer that are of little consequence to the project expenditure, but create positive experiences for the property owner. It may be necessary to secure a permit of entry from the property owner to perform the work. Properties that are under condemnation should not be altered without the Division Right of Way Agent's approval. Contact the Division Construction Engineer for further guidance.

When ingress and egress must be provided to a property and the proposed concrete driveway is of sufficient width, it may be cast in half width sections, if approved by the Engineer. The Engineer should check the plan location of all driveways with right of way agreements to ensure the correct location is obtained. The Technician shall check with the Engineer before moving any driveway from a location originally shown on the plans. No additional driveways other than those shown on the plans shall be placed without the prior approval of the Division Engineer and/or the municipality whose ordinances may govern this section of road. Before the Engineer considers revising the plan width of any driveway, he shall check with the Division Engineer and/or municipality to determine if an increase in width is in accordance with ordinances established. The Engineer shall not add sidewalk without prior consultation with the Division Engineer, because the incorporation of sidewalk through a project is often governed by a municipal agreement.

The location of wheel chair ramps and curb cuts are determined prior to the location of stopbars and crosswalks. As a result, the curb ramps and cut ramps are misplaced in relationship to the stopbars and crosswalks. This should be discussed at the monthly construction meeting held before the work begins. The Technician and the Contractor should consider the location of the stopbars and crosswalks when laying out the wheel chair ramps and curb cuts. Curb ramps will be stationed on the Pavement Marking Plans, do not use the the locations shown on the Roadway Plans, as they are shown for quantities. Lay out stopbars as shown on signal plans

prior to constructing curb ramps and/or curb cuts. Place curb ramps and/or curb cuts in front of stopbars. Install curb ramps and/or curb cuts where shown on the plans. If the plans do not require sidewalk, install curb cuts only. Please refer to the May 20, 2009 memorandum from Mr. Kevin Lacey, P. E, for procedures to locating curb cuts.

TECHNICIAN'S CHECKLIST
SECTION 848
CONCRETE SIDEWALKS, DRIVEWAYS, AND CURB RAMPS

1) Subgrade should have been properly compacted and shaped prior to form placement.
2) Check the soundness of forms prior to placement.
3) The forms should be set according to given line and grade and checked for thickness and horizontal alignment prior to concrete placement.
4) The Technician should ensure that joints are placed in the correct location.
5) Finished sidewalk, driveways and wheelchair ramps should be checked immediately following placement for surface tolerances, low spots, irregularities, honeycomb, etc.
6) Ensure transverse broom finish.
7) Curing should be performed in accordance with Article 825-9 of the Standard Specifications.
8) Concrete should be protected from cold weather in accordance with Article 825-8 of the Standard Specifications.
9) Joints should be sealed according to the Specifications.
10) The Contractor should not mark or deface the sidewalk by subsequent construction operations.
11) Place curb ramps/curb cuts as shown on plans, install truncated domes.

SECTION 850
CONCRETE PAVED DITCH

850-3 CONSTRUCTION METHODS

The Technician and Engineer should refer to the appropriate plan standard for construction details of paved ditch. The location of paved ditches shall be reviewed and may be adjusted as required by the Engineer. Paved ditches shall be constructed on firm ground and shall be graded to typical sections required by plan standards. The use of forms will be required as set forth in Article 825-2 of the Standard Specifications. The paved ditches shall be constructed to blend with the surrounding terrain. Toewalls are required at both ends of the paved ditch.

Do not extend beyond the limits shown on the plans without reviewing the permits.

Water should not stand in the finished paved ditch. This can be checked by the use of a string line or straightedge. Care should be exercised when tying paved ditch into pipe, headwalls, etc., to ensure that the paved ditch is shaped to pass water into these drainage structures.

Joints shall be filled in accordance with Article 825-10(F) of the Specifications. Backfill shall be placed no sooner than three curing days but no later than seven days after completion of the curing period. The backfill material should be compacted to a degree comparable with adjacent earth material. Paved ditches should be installed as early as possible to minimize soil erosion.

850-4 MEASUREMENT AND PAYMENT

Any excavation and backfilling necessary to construct the paved ditch below the typical section line is considered incidental to the paved ditch and no separate measurement or payment will be made for this work.

SECTION 852
TRAFFIC ISLANDS AND MEDIANS

852-3 CONSTRUCTION METHODS

The base material for any island or median shall be uniformly graded and compacted to the satisfaction of the Engineer. All base material under traffic islands or medians shall be treated with a herbicide, which will act as a soil sterilant. Any individual applying herbicide on a project must be properly licensed or working under the direct supervision of a properly licensed applicator.

The Engineer should check the surface drainage in the surrounding area prior to placement of traffic island or median to determine that the placement of these islands or medians will not adversely affect the drainage. Brooming of the concrete surfaces in medians shall be done transversely to the direction of traffic unless otherwise directed by the Engineer. The Technician should refer to the appropriate plan standard for details of joint construction and location of joints. In order to match existing joints in surrounding pavement or curb and gutter, much thought must be given to joint location in medians and islands prior to the actual construction operations of these items. Joints should be matched with adjacent joints in curb and gutter or pavement if possible.

Traffic islands and medians are normally designed and located to function with the handling of traffic and no revisions to this design or location should be made by the Engineer without prior consultation with the Design Engineer. It is a good practice to delineate the limits of the island during stake out. The proposed location of any signing within the island should also be shown. A trial run with a typical vehicle that might be expected to use the particular intersection can be made and any conflicts resolved prior to construction. A school bus or Contractor's lowboy is usually a good "worst case" vehicle to use for the trial run. Notify the Engineer when changes appear necessary.

While there are no specific tolerances for the surface stipulated in the Specifications, the finish of the islands and medians should be uniform and generally not deviate more than 1/4 inch in 10 feet from a plane. Where the islands are not keyed in with at least two inches of asphalt, 40-penny nails should be utilized to dowel the concrete island into the base material. A 12-inch hole for signposts is required through the island into the subgrade.

SECTION 854
CONCRETE BARRIER

854-3 CONSTRUCTION METHODS

(A) CAST IN PLACE OR SLIP FORMED

Class AA concrete will be used and all concrete should be constructed in accordance with the requirements of Section 825 of the Specifications. Before placing of any median barrier, the Technician shall refer to the appropriate plan standard for details of construction. This item, like curb and gutter, is a very visual item and contributes to the appearance of the project as a whole; therefore, special attention should be paid to the line and grade of the median barrier. Forms should be securely anchored as the forms will tend to ride upward because of the pressure of the concrete. Expansion joint material and joint spaces shall be perpendicular to the grade. Care should be taken to prevent displacement of these joints during concrete operations. Make neat joints. The top of the wall should be checked as soon as practical with a ten-foot straightedge.

When extruding or "slip forming" the median barrier, a concrete mix with a slump of approximately one inch should be maintained and the machine should be operated at a **constant speed** with the hopper full at all times. This is critical to obtain a good end product.

(B) PRECAST

Precast units are inspected by the Materials & Tests Unit during and after fabrication, and if considered acceptable will have a stamp placed on the end of each unit indicating "NCDOT Approved." Precast barrier units should be carefully examined before installation to ensure no damage has occurred in transit. Any corrections necessary to any units caused by damage or surface irregularities must be reviewed and approved by the Engineer consulting as necessary with the Materials & Tests Unit.

Fill connector pin area and pick-up holes with 5000 psi non-shrink, non-rusting grout.

SECTION 857
PRECAST REINFORCED CONCRETE BARRIER – SINGLE FACED

857-3 CONSTRUCTION METHODS

If the lanes where the barrier is being installed are open to traffic, the Contractor should not be allowed to begin placement of the barrier units until he has the material and equipment on the project and is ready to construct the guardrail and anchor unit on the approach end.

Only an approved lifting device should be used to load, unload, or position the barrier units. The connectors on the barriers should never be used as pickup points. Alignment is critical so that final appearance is satisfactory.

Only one type of delineator and one attachment position should be used throughout a project. Delineators should be positioned perpendicular to the road and the color of the delineator should supplement the adjacent edgeline.

SECTION 858
ADJUSTMENT OF CATCH BASINS, MANHOLES, DROP INLETS, METER BOXES, AND VALVE BOXES

858-1 DESCRIPTION

This work will be considered an adjustment where the item is raised or lowered two feet or less in elevation. Raising or lowering beyond the two feet will be measured and paid for separately. For example, if a 3-foot elevation differential is involved, the top two feet of construction is considered and paid for as an adjustment and the remaining one foot is considered and paid for at the contract unit price per linear foot for "Masonry Drainage Structures."

858-3 CONSTRUCTION METHODS

All existing walls shall be removed to a depth sufficient to provide for the adjustment. The adjustment will be performed with the appropriate item of either brick masonry or Portland Cement Concrete. If the Engineer permits the utilization of cast iron or steel fittings for an adjustment, these fittings must be securely attached to existing wall. This may require welding by the Contractor. The Engineer should not approve them for use unless the attachment will eliminate movement. They shall be installed in a manner so as to eliminate movement of the fitting.

The concrete used to backfill adjustments in an existing pavement shall be cured and protected from traffic until such time as the concrete has obtained enough set that traffic will not damage it. The Engineer may approve the use of "Sakrete Concrete" mix for backfill of the adjustment provided the manufacturer's instructions on the bag are followed for its use. No traffic or paving shall be allowed around the adjusted structure until 2500 psi strength is achieved or 72 hours, whichever is first, after the concrete is cast. Bituminous materials will not be permitted as backfill. Backfill of areas outside of existing pavement should be accomplished by the use of materials comparable to the existing adjacent area. In areas to be surfaced or resurfaced, this adjustment shall be made before the final layer of surfacing material is placed.

The Technician should check these adjustments to ensure that the surface of the adjustment in paved areas will conform to the pavement grade and slope. It is necessary that string lines, straightedges, etc., be used to properly adjust and orient these items so they will meet the surface requirements of the paved surface. When the lid of a manhole is more than 1/8 inch depressed into an existing ring, the local utility owner should be contacted to secure a replacement manhole ring and cover. Even the best adjustment will ride poorly with a worn ring.

If traffic will be allowed to travel over the adjusted structure prior to placing the surfacing material flush with the top, ramps must be constructed of asphalt at least three feet wide on all sides of the structure before removing the barricades. This temporary asphalt ramp shall be placed within 24 hours of the adjustment and should be removed prior to the final surfacing. The contract special provisions may be more restrictive and should be consulted. The final surface should be placed within seven days of the adjustment.

858-4 MEASUREMENT AND PAYMENT

If the contractor elects to lower the utility prior to milling and raise in conjunction with the final surface, pay for only one adjustment.

SECTION 859
CONVERTING EXISTING CATCH BASINS DROP INLETS AND JUNCTION BOXES

859-1 DESCRIPTION

This section of the Specifications governs the conversion of one type of an existing drainage structure to another type of drainage structure.

859-3 CONSTRUCTION METHODS

The methods involved in the conversion of one type of drainage structure to another are similar to that used in the construction of new masonry drainage structures. The Technician should thoroughly inspect the existing structure to ascertain if the portions, which are to remain, are structurally sound. Any unsound portions should be repaired or replaced by new construction. There may be instances where entirely new construction will be required, in which case the provisions of Section 840 shall govern.

SECTION 862
GUARDRAIL

862-2 MATERIALS

All materials for permanent guardrail shall meet the requirements of Division 10 of the Specifications. The Engineer shall approve any used materials for temporary guardrail construction. The Project Special Provisions require the Contractor to furnish installation procedures for each anchor unit prior to installation. The correct installation instructions are an absolute necessity for the proper inspection of this critical item. The purpose of this provision is for the Technician to have the most current information to ensure the anchor unit is installed correctly. Anchor units are proprietary and the installation **should not deviate** from the manufacturer's recommendations.

The Project Special Provision also requires the Contractor to furnish a FHWA acceptance letter for each anchor unit installed on the project stating that each anchor unit meets NCHRP Report 350, Test Level 3.

Guardrail materials are on the North Carolina Brand Registration Program. Only producers and suppliers who submit a yearly Brand Certification and Guarantee and adhere to the requirements of the program as specified by the Materials & Tests Unit can sell guardrail to the Department. Mill certifications are maintained by the producer at his facility for a minimum of five years. Copies of the mill certifications are not required with the guardrail shipment. As part of the producers' final quality control check, they must attach a sticker to each bundle of guardrail and on each pallet containing guardrail materials shipped to a NCDOT project or maintenance facility. The sticker will have the name of the producer and the location of the plant where it was produced to alert the Technician that the guardrail is from an approved source. Project personnel will record the name of the producer and the plant location on the Materials Received Report, along with the product dimensions and description.

A Producers' sticker does not mean the guardrail is NCDOT approved and the Materials & Tests Unit must inspect the guardrail after it is installed. The Engineer must notify the Materials & Tests Unit to ensure that all guardrail is inspected. If traffic control is in place and is scheduled to be moved, the Materials and Tests Unit should be notified to inspect the guardrail while under the protection of traffic control.

862-3 CONSTRUCTION METHODS

Guardrail design and installation are evaluated using crash tests over a range of impact conditions. Deviation from the installation requirements may result in the barrier failing to perform as desired. The Engineer should make a determination of guardrail locations as soon as possible and advise the Contractor, in writing, so that materials may be ordered and schedules met. It is common for guardrail contractors to purchase rail elements early in the life of the project to insulate themselves from the effects of raw material price increases during the job.

The Engineer should conduct a field investigation to determine the location of anchor units and if guardrail is required at locations not shown on the plans. Addition of guardrail or moving an anchor unit after all guardrail has been installed may result in a request for additional compensation for re-mobilization by the Contractor. Guardrail can be a hazard if installed where no warrant exists.

The Engineer and Technician should refer to the appropriate Standard Drawings and/or plan standards, or catalog cuts, for the details of construction of guardrail. Shoulder slope and rail height are critical to satisfactory performance. The Engineer should assure himself that fill

sections are correctly slope staked. The Technician shall check the Contractor's proposed layout of guardrail alignment to ensure that the offset distance from edge of pavements and back of curbs has been maintained and that alignment and elevation of posts will be according to plans. Guardrail is usually placed prior to the final surface course. The thickness of the final surface must be taken into account when checking installation height. Be sure to account for additional wearing surface when working on the high side of a superelevated curve. When the rail element is placed on the post, the Technician should check to determine that all rail elements and terminal sections are lapped correctly.

No revision in guardrail design or attachments may be made by the Engineer without consultation with the Roadway Design Unit to determine that strength requirements are being met. When utilizing timber posts, 6-inch diameter pilot holes are required in fills whose slope is 1-1/2:1 or greater with a fill height of 15 feet or more. The post area shall be backfilled in accordance with the requirements of this article of the Specifications. Any scratched, scarred, or abraded areas of guardrail detected after erection shall be cleaned and painted with two coats of zinc rich paint. Zinc paint from aerosol cans is not acceptable because aerosol paint does not produce an adequate wet mil thickness.

The Technician should check randomly to determine that the correct washers, bolts, and nuts are utilized. Where traffic is being maintained, do not create a hazard during guardrail installation by leaving incomplete guardrail sections subject to direct end hits before they are safely anchored. Traffic phasing may require that an approach end anchor unit be used where a trailing end anchor unit is required by the plans for the final traffic pattern. Ensure that guardrail is lapped correctly during all phases of construction.

862-6 MEASUREMENT AND PAYMENT

The quantity of permanent or temporary guardrail to be paid for will be the actual number of linear feet of guardrail which has been satisfactorily completed and accepted exclusive of that length of guardrail which is within the pay limits of guardrail anchors. The Technician should refer to the appropriate Standard Drawings or plan standard to determine this pay length of guardrail anchors. Measurement is to be made from center of post to center of post.

Additional posts the Engineer feels are necessary for safety reasons should be measured for payment. If the Contractor, through negligence or carelessness, fails to construct an item where it was staked or was shown on the plans, and it is in conflict with a guardrail post, any extra posts needed because of his carelessness or negligence should not be measured for payment.

TECHNICIAN'S CHECKLIST
SECTION 862
GUARDRAIL

1) Check slopes to determine if they require guardrail protection.
2) Flatten slopes when permits and R/W allow, eliminating the need for guardrail. **Engineer must be contacted**.
3) Ensure shoulder slope in front of guardrail is graded to 10:1 or flatter.
4) Determine the location of the anchor units.
5) Locate underground utilities, including any shoulder drain, underdrain, or other installed drainage.
6) Check the guardrail to determine that it meets Section 1046 and detail in daily diary.
7) Check the post embedment and rail height to ensure they meet the requirements of the Roadway Standard Drawings.
8) If posts are embedded in rock, excavate shaft and backfill with Select Material, Class VI.
9) Verify that the post spacing meets the requirements of the Roadway Standard Drawings.
10) Check positioning of the rail to ensure that the face of rail meets the offset requirements of the Roadway Standard Drawings (rigid obstacle, curb and gutter offset, etc.).
11) Have installation instructions for the anchor units in hand for inspection purposes prior to installation.
12) Notify Materials &Tests Unit to inspect the rail.
13) The Engineer should check his plans to determine if guardrail attachments required on existing bridges will work.
14) Ensure anchor units are correct for both temporary and final traffic patterns.

SECTION 863
REMOVE EXISTING GUARDRAIL AND GUIDERAIL

863-2 CONSTRUCTION METHODS

Removal of existing guardrail includes any anchors, end shoes, sleeves, anchor plates, etc. within the limits shown on the plans or directed by the Engineer. While removing these items, any damage to any existing structures or other adjoining appurtenances shall be repaired at the Contractor's expense. If traffic is using the adjoining lanes, the removal of guardrail shall be done so as not to leave traffic exposed to an unprotected end of the rail, and the shoulder should be repaired to a safe condition, if damaged.

All components of the dismantled guardrail become the property of the Contractor unless otherwise denoted in the Project Special Provisions and should be removed from the project unless he intends to use it as temporary guardrail on the project in which case, it should be stockpiled in a location that is safely away from traffic.

SECTION 864
REMOVE AND RESET EXISTING GUARDRAIL AND GUIDERAIL

864-2 CONSTRUCTION METHODS

The Technician should check to make sure that the guardrail after it has been reset is in as good a condition or better than when it was removed. Any damage due to negligence should be repaired at the Contractor’s expense. After removal of posts, fill the existing voids.

SECTION 865
CABLE GUIDERAIL

865-3 CONSTRUCTION METHODS

Shoulder slope and rail heights are critical to satisfactory performance. Ensure the shoulder cross slope is not steeper than 6:1. The Engineer should perform a field investigation to determine if there is a need for guiderail in areas other than those indicated on the plans. The design deflection for guiderail is 11 feet. The Engineer and Technician should refer to the appropriate Standard Drawing and/or plan standards for the details of construction of guiderail. The Technician shall check post and cable height after placement. The post area shall be backfilled in accordance with the requirements of this article of the Specifications. The Technician should check randomly to determine that the correct washers, bolts, and nuts are utilized.

SECTION 866
FENCE

866-3 CONSTRUCTION METHODS

(A) CLEARING AND GRADING

Clearing shall be limited to that width necessary for the erection of the fence and to provide reasonable working room for the Contractor. Indiscriminate clearing shall not be permitted. When replacing a fence in the same location, removal of the existing fence is incidental. The fence should be erected to conform to the **general** contour of the existing ground. Minor grading may be required of the Contractor to provide a smooth contour of natural ground but proper drainage shall be maintained. The bottom of the fence shall not be more than six inches from the existing ground except where additional barbed wire is authorized for use by the Engineer.

(B) SETTING POSTS AND BRACES

If posts are required in concrete slabs such as slope protection, the holes shall be drilled and grouted in place. The use of impact hammers is not permitted because damage to surrounding concrete may occur. Sections of woven wire less than 100 feet may not be used unless authorized by the Engineer. If the use of woven wire pieces is permitted, any additional brace posts and braces required as a result of the usage of these short sections of wire shall be provided and installed at no cost to the Department. The Contractor may also elect to use splicing sleeves, which have been approved by the Materials & Tests Unit.

(C) INSTALLING FABRIC AND WIRE

(1) Chain Link Fence

Chain link fence shall be attached to line posts at the beginning and end ofrolls or pieces of rolls with stretcher bars and stretcher bar bands. The fabric shall be attached to all other posts with stretcher bars and bands. Mechanical fence stretchers are required to place tension in the fabric before fastening to posts.

(2) Woven Wire Fence

A fence stretcher is required to properly tension the fabric. Where woven wire is attached to wood posts, at least one staple is required in each line of wire. Additional staples may be required by the Engineer to properly secure the wire. No splicing is permitted between posts of a brace post assembly. Splicing in other locations is permitted if the Engineer has given approval of method and splicing sleeve. The Engineers have been furnished a list of those splicing sleeves which have been approved for use. Splicing of barbed wire between posts will not be permitted under any circumstances.

866-4 MEASUREMENT AND PAYMENT

It is usually beneficial for the Technician and the Contractor to verify measurement at the end of each day's operations, if possible, to maintain an accurate record of fabric completed. Any discrepancies can be rectified at this time. The Technician must not accept the Contractor's measurements for pay record purposes.

TECHNICIAN'S CHECKLIST
SECTION 866
FENCE

1) Ensure the Materials & Tests Unit is advised upon the arrival of materials that are to be tested.
2) All material should be sampled, tested, and approved before installation.
3) Check plans to make sure that the fence has been staked as specified on the plans.
4) For Controlled Access Fence, ensure the Right-of-Way Markers are not disturbed.
5) Check alignment, length of posts, spacing of posts, and depth of posts in ground or concrete as they are erected.
6) The type of fence should be indicated in the pay record book.
7) Use the required gauge and number of ties.
8) Place fabric on the correct side of the posts.
9) Space the wire correctly on the posts.
10) Check installation of splicing sleeves.
11) Place brace posts where needed.
12) Install additional barbed wire where needed.
13) Shape concrete around posts and remove excess concrete.
14) Ensure the concrete is cured.
15) Clean and repair damage with an approved paint.
16) Ensure hinges on gates are turned as shown on plans.

SECTION 867
FENCE RESET

867-2 CONSTRUCTION METHODS

Fence reset involves the removal of existing fences and the construction of a new fence utilizing the materials from the fence removed. The Specifications require that the reconstructed fence be equal to or better than the original fence. It is incumbent upon the Department's personnel to document the existing fence condition by pictures. This documentation will then serve as a standard for accepting the reconstructed fence. The Contractor will be expected to replace any of the original materials unnecessarily damaged by him at his own expense.

Should a property owner elect to furnish new materials of similar type to the existing materials, the Contractor must use the new materials in the reconstruction.

If the fence contains livestock, the Contractor will be responsible for assuring that they do not get out as a result of his operation.

SECTION 876
RIP RAP

876-1 DESCRIPTION

The requirements of the type of riprap to be used will be indicated in the plans as well as filter fabric if needed. Care must be taken to place no more rip rap than is allowed by the project permits. If a determination is made during construction that the footprint of the riprap should be increased, the Engineer should consult the permits and the Division Environmental Officer to ensure compliance.

876-3 PLAIN RIP RAP

The Technician should check with the Engineer prior to beginning this phase of construction to determine if any revision of plan locations is necessary. The area to receive plain rip rap shall be excavated to the depth required for placing the plan thickness of the rip rap material and the area should be graded to afford placement of a uniform thickness of rip rap. Grading may be done in conjunction with ditch excavation but will not be paid for as ditch excavation. Toewalls and other construction details will be indicated in the plans. It will normally be necessary for the Contractor to utilize some hand placement of plain rip rap in order to ensure a properly graded, dense, neat layer of stone. The Technician should pay attention to the placement of smaller stones throughout the rip rap to ensure that a uniform distribution of stone is obtained. Broken-up concrete may be used if it is free of rebar.

Plain rip rap is proven to be a very effective erosion control measure and velocity retardant for surface runoff. On grading projects where rock is readily and economically available, the Engineer should utilize this natural resource in erosion control devices throughout the project.

Where the Contractor requests to utilize rock excavated on a project for rip rap and it is not a waste project, he must be required to replace the quantity involved with a like quantity of acceptable material if his request is approved. Refer to Section 225-3 of the Specifications for procedure to follow.

If filter fabric is to be placed, carefully remove all debris that might tear the fabric under the rip rap. The rip rap should be placed carefully to avoid damaging the fabric. Since this fabric can be damaged by sunlight, the rip rap must be placed over it once it is in place within a period of seven days from the time it is unrolled. Any additional excavation required for the placement of the rip rap will be considered incidental to the cost of the rip rap.